Great River Energy is refilling these comments due to the fact that the edited version of comments was previously filed. Please use these comments instead on behalf of Great River Energy.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 90 of the Commission's Rules	)	WP Docket No. 07-100
	)	
	)	PS Docket No. 06-229
Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band	)	
	)	
	)	WT Docket No. 06-150
Service Rules for the 698-746, 747-762 and 777-792 MHz Bands	)	

Response to Request for Comments Regarding FCC Document 12-61:
"Improving Spectrum Efficiency in the 4.9 GHz Band"

Submitted by Great River Energy (GRE)

Great River Energy supports expanding eligibility for licenses in the 4.9 GHz band to Critical Infrastructure Industry (CII), including electric utilities. Additionally, GRE supports allowing fixed point-to-point and point-to-multipoint operation as primary on the band. By expanding eligibility to CII and allowing fixed operation on a primary basis, the Commission will be more likely to realize its goal of making improving spectrum efficiency in this band.

Great River Energy Background

Great River Energy is a not-for-profit generation and transmission electric cooperative owned by its 28 member distribution cooperatives. Those 28 member cooperatives in turn provide electrical service to approximately 1.7 million people in a 56,000-square-mile area from Minneapolis-St. Paul suburbs to very rural areas of the north shore of Lake Superior to the farmlands of southwestern Minnesota. The loads served by the member system are primarily residential, seasonal and agricultural loads. GRE owns and operates 12 power plants which generate more than 3,500 megawatts (MW) of electricity. GRE's generation capability is a diverse mix of baseload and peaking power plants, including coal, refuse-derived fuel, natural gas and fuel oil, as well as wind generation.

GRE owns and operates nearly 4,600 miles of transmission lines and owns or partly owns 109 transmission substations. Additionally, GRE interfaces with 28 distribution cooperatives at over 500 distribution substations and has over 150 downline motor-operated switches to which it communicates. All substations and motor operated switches require telecommunications for Supervisory Control and Data Acquisition (SCADA). Additionally, the 28 member distribution cooperatives require telecommunications for Distribution Automation of downline switches, regulators, reclosers, and motor operated capacitor banks. They also use telecommunications for Advanced Metering Infrastructure (AMI) and Automated Meter Reading (AMR).

In addition to SCADA communications, GRE owns and operates a trunked land mobile radio system that is used for voice communications for GRE and 14 of its member distribution cooperatives. GRE also has a very extensive Load Management/Demand Response system that controls air conditioners, water heaters, electric heat storage and irrigation systems during peak electrical useage. This system has the capability of shaving over 380 MW of load from the system. GRE uses synchrophasors for wide area situational awareness. These synchrophasors require very low latency, highly reliable telecommunications.

General Comments

Great River Energy strongly supports allowing the Critical Infrastructure Industry (CII) to have access to the 4.9 GHz band on a primary basis. Critical infrastructure will make excellent partners for public safety for communications, which is beneficial to public safety as well as CII for several reasons. During disasters, the ability to jointly use a network allows public safety and CII to be able to communicate, if needed. Additionally, a larger user base will allow for greater economies of scale resulting in lower equipment costs for all users.

In rural areas, the spectrum could easily be shared and the spectrum could be more efficiently used if CII were allowed to have access to the spectrum as a primary user. CII could help build out a network that could be used by both public safety and CII.

GRE currently operates a land mobile radio system that is very similar to the State of Minnesota's public safety multi-agency, state-wide public safety land mobile radio system. GRE, along with other electric utilities, have been in contact with the State of Minnesota regarding the possibility of sharing the PSBN and the State of Minnesota has stated that they support allowing electric utilities and other CII to share the PSBN. The 4.9 GHz band has the potential of being another shared service or network that could be beneficial to both public safety and CII. By having multiple users with similar coverage and reliability requirements, a network can be more economically built in a faster time frame.

Great River Energy owns and operates its own telecommunications systems for everything from land mobile radio voice to a broadband SCADA system that is used not only for SCADA real time control and monitoring, but also used for billing data from substations, network access at wi-fi hot spots for field technicians, and Voice over Internet Protocol (VoIP) telephones located in substations as well. We also operate private networks for Sychrophasors and our Load Control system. Private systems are widely used in the electric industry for a couple of reasons. First, many areas that require communications are in rural areas and most of these areas are away from major highways where commercial providers have coverage. Secondly, electric utilities' telecommunications systems need to be highly reliable. GRE is a black start utility, meaning that if electricity on the grid is out for an extended period, GRE needs to be able to start generators to get power flowing on the grid. The ability to start those generators requires communications and GRE is mandated to have that capability when power has been out for up to three days. For this reason, GRE has generator backup for a minimum of three days at all telecommunications sites. For practical matters, however, GRE stores a fuel supply of approximately two weeks at most telecommunications sites.

Electric utilities have designed, built, owned, operated and maintained private telecommunications networks for many years, most dating back to the 1950s or before. Additionally, utilities' telecommunications field technicians are geographically dispersed throughout service territories and are on call 24 hours per day, 7 days per week.

Responses to specific requests for comment:

28. Should all existing users be required to enter their technical parameters into a database? What technical parameters should be included?

GRE supports requiring all users of the 4.9 GHz spectrum to register the technical parameters of their fixed point-to-point, point-to-multipoint, and base-to-mobile stations into a database. Technical parameters that should be included in this database include:

- Latitude/Longitude of transmitters
- ERP
- Transmitter antenna height
- HAAT
- Latitude/Longitude of receivers (for fixed applications)
- Receiver antenna height (for fixed applications)

29. Do the anticipated benefits of using some form of a registration database outweigh the potential burdens imposed on licensees and applicants by the collection of the type of information with such a database?

GRE believes that the amount of work required to get the appropriate technical data into a database is less than the potential time it would take to troubleshoot interference if the appropriate data is not in a database and licenses are not properly coordinated. In regards to privacy and security of the data, given the nature of this data, it would make sense to not allow public access to the database, but only to those authorized to coordinate or use the 4.9 GHz spectrum to have access.

30. Could the Commission use a similar approach to leverage its experience and staff expertise to create a new dedicated 4.9 GHz database, thus leading to lower initial development costs and ongoing operating costs?

In addition to being more cost effective, modeling the 4.9 GHz database after an existing database would be easier and faster to implement.

35. Should the Commission require coordination for other uses, such as temporary fixed, mobile, and (as NSMA has urged) secondary permanent fixed uses? Should all possible uses be subject to a coordination requirement, or should certain uses be exempt and be subject only to Section 90.1209

Formal frequency coordination of all types of uses is very important. If there is not a formal coordination process or if formal frequency coordination is not required for all users, then there is a greater possibility of interference. Tracking down the source of interference will be more challenging and time consuming resulting in a higher cost to troubleshoot than the cost of coordination would have been. In most of the bands that GRE currently operates in, frequency coordination is required and the cost of frequency coordination is calculated into systems' budgets. All users should be required to go through a formal coordination process. Should the Commission decide that CII users need to be users on a secondary basis, and primary users do not have to be coordinated, then there is a greater possibility to the CII user of potential interference. In addition, CII users would be less willing to spend money to build networks that are at risk of interference. A coordination process for all users would at minimum ensure that secondary users would be notified of impending interference possibilities. Coordination requirements should be suspended during emergency situations when low-powered mobile networks can be set up on an ad-hoc basis.

40. Could RPCs manage coordination in each region by submitting regional plans to the Commission rather than having licensees register technical parameters in a database? How would RPCs be able to coordinate new applicants successfully around incumbent operations without a comprehensive database?

A comprehensive database accessible to all coordinators should be required for any type of frequency coordination. This database would need to be populated with existing users' data for both fixed and mobile uses.

41. What would be the appropriate deadline for RPCs to submit plans on guidelines to be used for sharing the 4.9 GHz spectrum within the relevant region? Would twelve months after the lifting of this stay allow sufficient time? Should we require periodic

updates to the plans to account for evolution in use of the band, and if so, what period would be appropriate?

Requiring a regional plan be submitted 12 months after this rulemaking should provide users with ample time. Periodic updates to the plans on an annual basis would also be a reasonable requirement.

43. Should the Commission extend eligibility to use the band to non-public safety users, subject to protections to maintain the integrity of public safety operations? Does expanding eligibility improve the availability, variety, and economics of equipment that uses the band, to the benefit of public safety operations? Should the Commission open eligibility to commercial users on a secondary or other non-interfering basis subject to a shutdown feature to enable priority access by public safety entities? Should critical infrastructure industry (CII) entities, including utility companies, be eligible to hold 4.9 GHz licenses on a primary basis, thus removing the requirement for a sharing agreement? How would allowing CII to be licensed affect the coordination schemes discussed above? Should the Commission extend eligibility to government entities that provide non-public safety services? Of what relevance here is the Spectrum Act's expanded definition of public safety entities to include emergency response providers? What other benefits might arise by relaxing use of the band? What are the costs for expanding eligibility, if any, including spectrum congestion?

GRE strongly supports expanding eligibility in the 4.9 GHz band to CII,utilities in particular. Utilities have similar requirements to public safety in two primary areas:

1) System Reliability – Telecommunication systems need to be there even when power is not.
2) Coverage – Utilities require telecommunications systems in rural areas away from major highways.

Commercial service is typically not available in rural areas. Additionally, commercial service providers generally do not have generator backup. Even if they do, it is not likely they would have ample backup for a a major disaster that resulted in power loss for several days. Electric utilities' telecommunications systems are designed, operated and maintained to be highly reliable, have low latencies (which are required for monitoring and control of the electric grid) and provide coverage in their operating areas, which may be very remote. They are generally maintained by telecommunications technicians that are regionally located and on call 24 hours per day, 7 days per week.

Electric utilities use telecommunications systems for a variety of applications. Land mobile radio systems for voice are of utmost importance. These systems are a field service crews' lifeline when they are performing repair or maintenance work on the electric grid, which in its nature, can be life threatening work due to the high voltages of power lines. They use voice communications for communicating with each other in the field or for communicating to their system operators. These systems typically cover a utilities' service area providing mobile coverage to vehicles. Land mobile radio systems are also used in the form of portable radios by employees at power plants for plant operation.

SCADA systems, often referred to as the eyes and ears of a power company, use telecommunications networks to gather data, which is sent to system control centers to monitor and control the electrical grid by system operators. SCADA systems also allow the electrical grid to be controlled remotely by system operators, or automatically without manual intervention, even when the device being controlled can be hundreds of miles away. SCADA systems minimize or prevent electrical outages, and if there are electrical outages provide the ability to restore power much more quickly.

GRE also operates an extensive Demand Side Management or Load Control system. This system uses wireless radio to send signals to air conditioners, water heaters, thermal storage devices and irrigation systems that are cycled during peak electrical use times resulting in fewer power plants needing to be built. This telecommunications system is vital during peak electrical usage both in the summer and the winter. This system, however, does not require generator backup as loads do not need to be controlled when there is no power on the grid.

In 2006, GRE installed a "broadband" SCADA communications network in the 700 MHz A band by leasing spectrum from Access Spectrum. These 2 - 1 MHz channels provide GRE with the capability of having not only a larger pipe for SCADA communications, but also the capability of having network access for field technicians when they are in the vicinity of a substation using Wi-Fi hot spots installed in substations. This results in more efficient work by the technicians and faster maintenance because technicians do not have to drive back to their offices in order to access the network. GRE was also able to install Voice over Internet Protocol (VoIP) telephones in substations replacing land line phones, which can be hazardous in high voltage substations.

As mentioned in the introduction, GRE sells wholesale electricity to 28 distribution cooperatives. GRE's interface to its distribution cooperatives is at the distribution substation. GRE's distribution cooperatives have telecommunications applications as well and most of the "smart grid" applications are at the distribution level. GRE's distribution cooperatives also use telecommunications systems for SCADA (also referred to as distribution automation at the distribution electric level). Their SCADA systems provide the ability to monitor and control devices within a substation and downline devices such as switches, regulators, reclosers, and capacitor banks. Monitor and control of these devices result in less electrical service interruptions and faster restoration of electrical service. Many of these capabilities are just now being implemented. Because there are many more distribution system devices on the electrical system, there is a greater demand for bandwidth as these devices are being deployed more now than they were in the past for generation and transmission telecommunications networks. There is a greater demand for data capacity, but these systems also need to be highly reliable and provide coverage to even more remote areas than areas served by GRE as they need to have coverage down to individual homes and the power lines that serve them. Distribution cooperatives also have private land mobile radio systems used for the same purpose as GRE's land mobile radio system.

Automated Meter Reading (AMR) has been used by GRE's distribution cooperatives for many years. In rural areas, the ability to remotely and automatically read meters is very economical due to the few number of meters per mile. In the past, most of GRE's distribution members' AMR systems have used power line carrier using a very slow speed signal on the power line to read meters. AMR systems are typically a one way communications system with a master collection device polling the meters and waiting for a response. As "smart grid" has developed and with it the requirement of faster meter reading and providing more data to consumers, Advanced Metering Infrastructure (AMI) is replacing AMR. However, AMI requires two-way communications and more frequent meter reads are required. AMR systems typically read meters monthly and power line carrier systems can typically only read meters once per day. Meter readings every hour and possibly every fifteen minutes are becoming standard expectations and may soon be mandated. Power line carrier is no longer an option to meet those requirements and wireless AMI systems are now becoming common place. While AMI systems can be data intensive (particularly in the case of 15 minute data reads), this data is not critical during emergency situations when power is out. Meter readings do not change when there is not power flowing to them. For this reason, this may be a great application for sharing on a public safety network. When a public safety network is busy, such as during an emergency or when power may be out, this data goes away. For this same reason, this is also an application that potentially makes sense to use commercial networks as the reliability requirements are not as great. Utilities could decide what makes the most sense for them based on cost and coverage.

Synchrophasors are a newer device that are used by electric utilities and require very reliable, low-latency networks. Synchrophasors are used to monitor grid stability on a millisecond basis. They can sense grid instabilities long before they'd ever be able to be detected by a human and changes can be automatically made in the electrical grid to prevent outages. This is a new application requirement, but is growing very rapidly in its deployment. It is another system that will require a highly reliable, very low latency telecommunications network.

GRE has been in contact with the State of Minnesota regarding the potential sharing of the Public Safety Broadband Network (PSBN). Potential sharing of the 4.9 GHz band is another logical system for partnering, especially if 4.9 GHz is used to backhaul the PSBN. In rural areas in particular, joint networks between public safety and CII make sense from an economical standpoint. Additionally, there are many cases during emergencies that an electric utility needs to have direct communications with public safety. By having shared telecommunications networks, that capability is possible even though from a day to day operations perspective, the systems would operate autonomously.

With the possibility of CII being a partner with public safety on the PSBN, CII having access on the 4.9 GHz band would be a requirement if 4.9 GHz is to be used as backhaul for the PSBN.

GRE supports the licensing of fixed point-to-point operations as primary for both broadband and narrowband operations. Flexibility for the spectrum is very important if it is to be used efficiently as is the Commission's ultimate goal.

GRE does not support expanding eligibility of the band to commercial providers on a secondary basis. If the band is used by commercial providers, it may become congested and potentially cause interference to primary users. This could be catastrophic in the event that the 4.9 GHz were to be used as backhaul for the 700 MHz PSBN and there were to be a major emergency that would fill up the bandwidth with commercial users and the proper safeguards were not in place to remove the commercial traffic from the network. There could be the potential for the 700 MHz PSBN to be inoperable.

By expanding eligibility of the band to CII, telecommunications systems can be more quickly and economically built and the band can be more efficiently utilized. In rural areas in particular, partnering together to build systems may be the only way a system can be built and there is plenty of bandwidth to share.

44. Would usage-specific radio service codes be duplicative of the current system of station class codes for different uses on a single license?

GRE supports usage-specific licenses as they would assist in frequency coordination and also in troubleshooting interference should it arise.

46. Should the Commission promote use of the band by allowing all permanent fixed point-to-point operations on a primary basis, regardless of whether they support broadband or narrowband traffic? Would such action result in prolonged interference disputes or increased coordination challenges.

GRE supports licensing both fixed point-to-point and point-to-multipoint operations on a primary basis for both broadband and narrowband traffic. SCADA traffic generally does not require a significant amount of data, and this may be a very suitable and desirable application for fixed operation on a narrowband channel. By requiring coordination for all users, interference disputes should be easier to resolve or prevent.

47. The Commission seeks comment on the use of the 4.9 GHz band for fixed, backhaul and mobile uses in support of the 700 MHz band public safety broadband network, and whether such uses are appropriate or desirable. What changes to the 4.9 GHz rules are necessary to better enable the 4.9 GHz band to complement the 700 MHz public safety broadband network?

GRE believes the 4.9 GHz band provides a great opportunity to be used as backhaul for the 700 MHz PSBN; however, it is important that power levels be increased to at least 63 dBm for point-to-point operations and 53 dBm for point-to-multipoint operations to allow for reliable paths.

48. How could fixed links in the 4.9 GHz band complement the 700 MHz broadband public safety network? What other dual-band applications do commenters envision? How can fixed links be used during day-to-day operations as well as during emergencies or disasters? Are there applications, system configurations, or geographic morphologies that are best suited for fixed use in the 4.9 GHz band? What changes to the 4.9 GHz rules, if any, are necessary to enable fixed links in the 4.9 GHz band to complement the 700 MHz public safety broadband network?

Different areas require different types of communications. GRE views 4.9 GHz as one option in a portfolio of potential backhaul options for the 700 MHz PSBN. There are some locations where fiber would be more suitable and other areas where fiber would either be too expensive or its use would be limited by the terrain in the area.

In addition to 4.9 GHz being able to be used as a fixed operation for 700 MHz PSBN backhaul, there are many other fixed applications for which utilities could potentially use 4.9 GHz spectrum, including SCADA, distribution automation, load control and AMI. Additionally, more wireless applications will be coming as smart grid applications are developed and deployed. Wireless LANs within substations will eventually become commonplace and this frequency band may be a good fit for that application.

49. How could the 4.9 GHz band assist public safety communications with their backhaul needs? What specific rules could allow 4.9 GHz networks to complement 700 MHz networks?

In order to promote flexibility, which will in turn allow the band to be more efficiently used, GRE does not support mandating specific rules for use. Public safety users, like utilities, need multiple telecommunications options as one frequency band does not fit all applications and locations - what may work in one area may not work in another. As mentioned previously, if 4.9 GHz is to be used as backhaul for the 700 MHz PSBN, it is important that the power limits be increased to 63 dBm for point-to-point operations and 53 dBm for point-to-multipoint operations.

54. Should some or all of the 1-MHz bandwidth channels be dedicated for non-broadband (*i.e.*, narrowband) use on a primary basis, and would such a designation promote use of the 4.9 GHz band? Would such designation be detrimental to broadband applications? What would be the costs associated with such designation? Are ten 1-MHz bandwidth channels sufficient, and if not, what quantity should the band plan provide? On the other hand, should the Commission reduce the number of 1-MHz bandwidth channels to provide more spectrum for broadband applications, notwithstanding that current rules allow users to aggregate the 1-MHz channels to form larger bandwidths?

GRE supports keeping the narrow channels as they could be used for most utility applications. Most utility applications are not broadband and could be served using the 1 MHz channels. As mentioned previously, GRE uses the 700 MHz A band spectrum for a wide-area SCADA communications network. These 2 - 1 MHz channels provide more than adequate bandwidth for SCADA requirements and also substation meter billing data, intranet and internet access for field technicians, VoIP telephony and backhauling AMR/AMI data. Compared to the 12.5 kHz channels utilities typically have access to, 1 or 2 MHz of bandwidth can accommodate most communications requirements. For electric utilities doing 15-minute residential meter reads, however, more bandwidth may be required.

55. **Should the Commission designate certain channels in the band for specific uses, such as fixed point-to-point or mobile operations?**

GRE does not recommend usage specific channels. There may be areas where more fixed communications are required and areas where more mobile communications are required. If channels are usage specific, there is potential for situations where areas of the band may become congested while nearby areas of the band are being used sparingly.

58. What should be the ERP limit for high power, permanent and temporary fixed transmitters? Is there a practical limit to the size of antenna that may be employed?

GRE recommends increasing the maximum ERP of 63 dBm for point-to-point operation and 53 dBm for point-to-multipoint operation. Depending on where eNodeB base stations are located for the PSBN, if 4.9 GHz is used for backhaul of the 700 MHz PSBN, there may be practical limits to antenna size. Electrical utilities, for example, have suggested that eNodeB base stations could be located on electrical power poles or towers, in which case large dish antennas, eight-foot dishes, for example, would not be able to be easily located on these types of structures.

59. Should point-to-point links be required to use a specific polarization, *e.g.*, horizontal or vertical, to reduce potential interference to other links or to portable or mobile devices? Should the Commission specify the polarization to be used in devices other than point-to-point links? What are the costs to retrofit or replace an antenna to change its polarization? Would polarization diversity increase the number of links that could be placed in a given area, thus increasing throughput?

Polarization is a tool that can be used to mitigate interference. If there is a database and licenses are coordinated, polarization could be used during coordination to alleviate potential interference. There may be areas where it makes sense for two systems of similar use to use different polarizations to mitigate interference. The cost to retrofit or replace an antenna to change its polarization depends on a number of factors, including the location of the antenna, the height of the antenna and whether it is a mobile or fixed device. A fixed device requiring a tower climb to replace what is located a long distance from a service shop would cost thousands of dollars to change. An antenna in a mobile device that could be driven to a service shop and is easily accessible, may cost closer to one hundred dollars to change.

64. Does achieving the goal of interoperability for the 4.9 GHz band require the Commission to determine a standard for deployment in this band, or is a more flexible approach possible?

While standards are important, and Commission mandates are one way of ensuring standards are in place, another effective option for standards creation is a more flexible approach where the nature of the marketplace influences the users and vendors to establish appropriate standards Should the Commission seek to mandate standards, it is important they be carefully developed to accommodate the often-rapid evolution of technologies and the standard and technologies being used in other parts of the world, which would also help maintain a competitive marketplace.

65. Because the 4.9 GHz band supports a variety of services, would it make sense to set multiple standards depending on the type of use rather than a single standard for all uses? Would standards benefit the public safety community by promoting interoperability?

If the Commission should decide to develop standards in this band, multiple standards for different uses would be needed. Again, while standards will benefit the public safety community and anyone else that may share a network with them, any mandated standards would need to be flexible enough to accommodate a changing network as it evolves in time and technology.

Conclusion

Allowing entities with similar communications requirements as the public safety community to share the 4.9 GHz band would create a broader market which would increase equipment competition and result in lower cost equipment. In rural areas where there is a significant amount of bandwidth and few users, sharing a network with other entities such as CII, utilities in particular, would result in a more effective use of the 4.9 GHz spectrum.

Respectfully Submitted,

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